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R. L. Preston

Ohio Agricultural Research and Development Center

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South Dakota State University
Brookings, South Dakota

Department of Animal Science
Agricultural Experiment Station

Effect of Nutrition on the Carcass Composition and Quality of Cattle

R. L. Preston

Animal Science Department
Ohio Agricultural Research and Development Center
Wooster, Ohio

Beef is a highly desirable food, both nutritionally and for the pleasure it gives during its consumption. Protein of high quality is the major nutritional asset of beef, as well as supplying certain minerals and vitamins. As important as this role is, it is not the main reason that beef is the most desired of all meats. Beef is consumed because it provides great satisfaction. What then contributes to this satisfaction?

The main taste attributes of beef probably are due to the fat it contains. Protein, free of fat, probably tastes the same whether it is from cattle or other animals. Therefore, fat plays an important role in the flavor, juiciness and tenderness of beef. On the other hand, fat in the carcasses of beef cattle can be a great waste, both in terms of retail yield as well as feed required to produce this fat. Therefore, those systems of production which will maximize the desirable attributes of beef without undue waste fat should be preferred systems. The deposition of fat in growing cattle is not simply a matter of excess calorie consumption. Rather fat and muscle develop simultaneously as part of the normal growth process. The ratio of fat to muscle depends primarily on the weight of cattle, with heavier cattle depositing more fat in relation to lighter weight cattle.

Currently, the measure of carcass quality that is thought to be most closely related to desirable eating qualities of beef is the degree of marbling present in the meat itself. The role of marbling is probably of less importance today than formerly because of present feeding practices which result in cattle reaching slaughter weights at a much younger age. It is questionable whether degree of marbling is related to any great extent to tenderness and other palatability factors in cattle that grade good and choice and are less than 2 years of age. Nevertheless, marbling is what determines grade, which in turn determines price.

Therefore, what do we know about the development of marbling in beef? First of all, it is related to the total fat in the carcass. Statistically speaking, about 50% of the variability in marbling score is related to variations in the thickness of fat cover. This results in a partial dilemma. More marbling is generally associated with more outside fat cover which is wasteful.

In cattle studies where relative plane of nutrition has varied, that is where energy or concentrate levels have varied when evaluated at equal final weight, there has been little or no difference in the total amount of fat found in the carcass. Surprisingly, this is also true when varying levels of protein

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are fed, even levels which reduce the rate of gain in cattle. One conclusion is that as long as cattle continue to gain weight, even though it may be at a slow rate, their final carcass composition will not be changed. Since maturity would increase with production systems that require longer feeding periods, more marbling would be required to equal the grade on younger cattle.

When cattle are subject to long periods of weight loss followed by a full feeding period on grain, some evidence indicates that the deposition of fat in the meat (marbling) is reduced and the deposition of fat on the outside (fat thickness) is increased. This would be very undesirable.

Various systems in both calves and yearlings have been tested where concentrate and roughage have been fed at different rates and at different times during the growing period. When cattle continuously gain weight, none of these systems appeared to increase marbling or decrease fat cover when the carcasses were evaluated at equal weight. Heifers carry more fat at the same live weight compared to steers, and steers have more fat than bullocks.

What feeding systems can producers use to accomplish the difficult task of producing beef carcasses with ample marbling and a minimum of outside fat cover? Plane of nutrition will not greatly affect the final composition of cattle carcasses. The only exception is when cattle lose weight over an extended period which results in decreased marbling and more fat cover when they are finished.

Other alternatives may result in changes in production systems in the future, however. These are:

1. De-emphasis on the importance of marbling in cattle that are 2 years or less in age. This would permit the feeding of increased amounts of concentrate to cattle that have heavier mature body weights and carry less fat, including marbling, at normal slaughter weights.
2. Feeding of bulls (bullocks) which will require feeding high levels of concentrate in order to produce the desired slaughter weight before the development of tough muscle fibers and connective tissue which begins to decrease the tenderness of bull carcasses at about 16 to 18 months of age.
3. Use of genetic lines which have a greater degree of marbling, since marbling or at least tenderness appears to be partially inherited.